

later mechanical philosophy. Such philosophers as Leucippus (ca. 480–ca. 420 BCE) and Democritus (ca. 470–ca. 380 BCE) were called *atomists* because they sought to explain phenomena in nature by appealing to their constituent elementary particles, or atoms. They characterized these particles in terms of their shape and size, and then appealed to these properties to explain the characteristics of the macroscopic objects they comprised. Thus, Democritus proposed that hot bodies were hot because they were composed of elements of fire, which were small and round, whereas cold bodies were cold because they were composed of larger particles with sharp points. The early modern mechanists followed the atomists in appealing to the shapes of the hypothetical minute components of material objects to explain the properties of macroscopic objects.

One of the most prominent of the early modern mechanists was Galileo Galilei (1564–1642). He is celebrated for developing a mechanics of simple moving bodies, an account he extended to explain celestial phenomena such as the movement of the earth around the sun. He also developed hypothetical mechanisms to account for mundane phenomena, and here the inspiration of the atomists is most clear. For example, he offered the following explanation of the power of heat to liquefy bodies:

The extremely fine particles of fire, penetrating the slender pores of the metal . . . fill the small intervening vacua, and . . . set free these small particles from the attraction which these same vacua exert upon them and which prevents their separation. Thus the particles are able to move freely so that the mass becomes fluid and remains so long as the particles of fire remain inside; but if they depart and leave the former vacua, then the original attraction returns and the parts are again cemented together. (Galilei, 1638/1914, p. 19)

Rene Descartes (1596–1650) provided perhaps the fullest development of the mechanical philosophy in the early modern period. As he said in *Principia*, “I have described this earth and indeed the whole universe as if it were a machine: I have considered only the various shapes and movements of its parts” (Descartes, *Principia* IV, section 188). In appealing to the motions of the parts as well as their shapes, Descartes added to the resources of the ancient atomists. A key component of his mechanistic conception was that the movement of one object would cause movement in another. In particular, because Descartes did not allow for empty space, any movement of one object required the movement of other objects.

Having emphasized the change caused by the contact of one body with another, Descartes, in contrast to both the ancient mechanics and to the Aristotelians who had seen mechanics as opposed to nature, argued for treating the